Tanta University — Third Year Students
Faculty of Engineering — First Term Exam
Computers and Control Department — January, 2013

DATABASE SYSTEMS — Code: CCE 3112

Answer the following four questions. Time allowed: 3 hours.

Question 1

(a) Give a definition for the database management system.
(b) What is a data model? Mention its main types. Why is the relational model, in particular, the most widespread?
(c) The NULL values are adopted to resolve the problem of incomplete information in relational models, but restrictions on the use of these NULLs do exist. Explain this assertion through illustrative examples.
(d) Prove mathematically that every relation has a key. Also differentiate between a key, superkey, and foreign key.

Question 2

(a) Why is relational algebra important in studying database systems?
(b) In what sense is relational algebra a pracedural language?
(c) Show that the natural join can be simulated through three consecutive operations: renaming, equi-joining, and projection.
(d) Consider the two relations of Fig. 1. Write relational-algebra expressions for the following requirements, and indicate the result in each case:

→

GRADUATES

Number	Surname	Age	TownOfBirth
274	Hegazy	29	Cairo
432	Aziz	32	Cairo
824	Mostafa	40	Tanta
951	Rashad	43	Alexandria

MANAGERS

Number	Surname	Age	Salary
297	Aziz	44	2000
432	Aziz	32	1500
824	Mostafa	40	1800
971	Sallam	46	2150

Fig. 1 Relations for part (d) of Ques. 2

(i) All available information of the graduates with ages less than or equal to 40 years and whose town of birth is Cairo.

(ii) The numbers and surnames of all managers.

(iii) The ages and salaries of the managers with salaries greater than 1500 Egyptian pounds.

(iv) The left, right, and full outer joins of the two relations.

(v) The union, intersection, and difference of the two subrelations:

$$\Pi_{\text{Number, Surname, Age}} (\text{GRADUATES})$$

$$\Pi_{\text{Number, Surname, Age}} (\text{MANAGERS})$$

Both of these subrelations have the same set of attribute names. Is this a necessary condition? Why?

Question 3

(a) What does the acronym SQL stand for?

(b) Write a short account on the families of SQL elementary domains that allow representation of time instants and time intervals.

(c) Choose a set of SQL commands that can construct a relation:

→

PERSON (ID, Specialization, City, Governorate)
with these specifications :

- The attribute ID is a primary key, with domain char (10).
- The attribute Specialization is subject to a constraint not null, with domain char (15).
- The attributes City and Governorate, with domain char (20) each, are subject to a constraint unique when taken together.
- The attribute Specialization refers to an attribute Specialty in another relation TUTOR, thus forming a foreign key.
- The foreign key specified above has correction policies cascade for deletions and set default for updates.

(d) Do the commands of part (c) belong to the data definition language (DDL) or data manipulation language (DML)? Why?

(e) What do the correction policies cascade and set default in part (c) imply?

Question 4

Consider the relation of Fig. 2. Write SQL queries for the following requirements, and indicate the result in each case :

(a) All raws that have no NULL values on the attribute Office.

(b) The contents of the relation with an ascending order of Salary.

(c) The number of offices.

EMPLOYEE

FirstName	Surname	Dept	Office	Salary	City
Mona	Amin	Administration	5	35,000	Cairo
Samir	Fawzy	Production	10	26,000	Port-Said
Gamal	Emran	Administration	10	30,000	Alexandria
Farid	Nabil	Distribution	8	35,000	Tanta
Samir	Amin	Planning	7	40,000	Cairo
Laila	Soliman	Planning	4	63,000	Mansoura
Ahmad	Zaher	Administration	30	30,000	Suez
Aly	Farid	Production	10	36,000	Port-Said

Fig. 2 Relation for Ques. 4

(d) The sum of salaries of the employees of the administration department.

(e) The least salary in each office of each department.

(f) The departments for which the average salary of the employees is equal to or greater than 35,000, and the average salary for each such a department.

Prof. Dr. Mahmoud M. Fahmy
Professor Emeritus

	Final Exam **1st Semester**
Department: **Computers and Automatic Control Engineering**	
Duration: **3Hours**	Date: **13th Jan., 2013**
Course Title: **CCE3115Control Systems Engineering**	
Instructor: **Dr Ahmed A. Ramadan**	Total Marks: 75

Instructions to Students

- *You should attempt all questions.*
- *The exam questions are only 4questions.*
- *The allocation of marks is shown in brackets by the questions.*
- *You must show all of your work -- partial credit may be given to partially correct answers, while answers with no justification may not receive full points.*
- *Answer all the parts of a question in sequence.*

[Turnover only when instructed to do so]

Problem (1) **(25 Marks)**

In airports conveyor belts are used to transport both humans and bags. We will study the velocity control for such a conveyor belt. A model for the relation between the control input $u(t)$ and the velocity $y(t)$ is given by:

$$G(s) = \frac{1}{(s+0.5)(s+2)(s+5)}$$

a) Suppose that the velocity is controlled by a P-controller $u(t) = K(r(t) - y(t))$ as shown in Fig. 1. **Draw the root locus**for the open-loop transfer function to show how the closed-loop system poles changes as K varies from 0 to ∞.**(11 Marks)**

b) From the root locus, determine the value of gain K for **critically damped response** (i.e. damping ratio is equal to unity). **(3 Marks)**

c) For K **= 15, draw the bode diagrams** for the open-loop transfer function of the system. **(7 Marks)**

d) From the bode diagrams, determine the Gain Margin GM, Phase Margin PM, the phase crossover frequency w_{pc}, and the gain crorssover frequency w_{gc}. **(2 Marks)**

e) Based on the results of part "d", Is the system stable? **(2 Marks)**

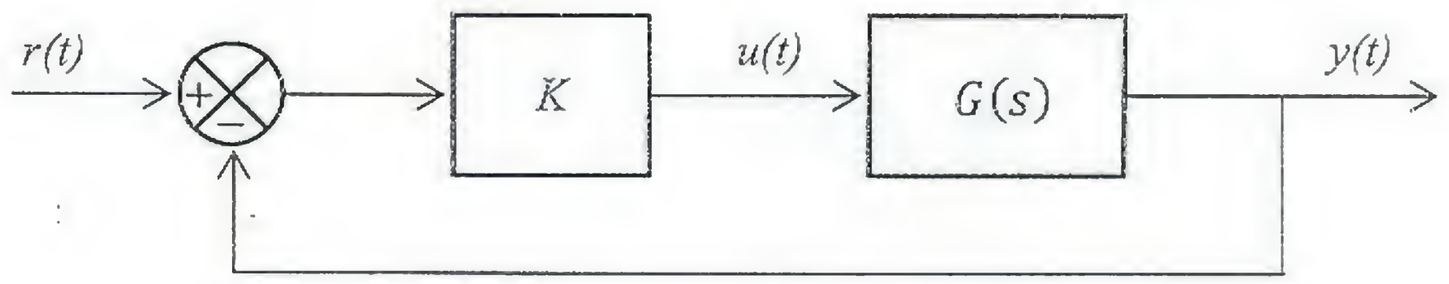


Fig. 1: Block diagram of problem 1

Problem (2) **(20 Marks)**

a) A tele-robot system has the following state-space equations:

$$\dot{x}(t) = \begin{bmatrix} -2 & 0 & 0 \\ -1 & -4 & 0 \\ -1 & -1 & -5 \end{bmatrix} x(t) + \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} u(t)$$

$$y(t) = \begin{bmatrix} 0 & 0 & 1 \end{bmatrix} x(t)$$

- Find the system characteristic equation and determine the stability. **(4 Marks)**
- Check the system state controllability. **(3 Marks)**
- Check the system state observability. **(3 Marks)**

b) The state-space representation of a satellite system is given by:

$$\dot{x}(t) = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} x(t) + \begin{bmatrix} 1 \\ 0 \end{bmatrix} u(t)$$

$$y(t) = \begin{bmatrix} 0 & 1 \end{bmatrix} x(t)$$

- Calculate the gain matrix K of the state-feedback controller needed to place the closed-loop system poles at $-1 \pm j$ **(5 Marks)**
- Calculate the observer gain matrix L such that the observer will be critically damped and its poles arelocated at $-4, -4$ **(5 Marks)**

Problem (3) **(18 Marks)**

A transportation conveyor belt system in a factory is modeled by the following transfer function, where $u(t)$ is the control input and $y(t)$ is the velocity:

$$G(s) = \frac{k}{s(s+1)(s+4)}$$

The block diagram that represents the conveyor belt system with its compensator is shown in Fig. 2. Design a compensating network to meet the following specifications:

- The damping ratio of the dominant closed-loop poles is 0.5
- The settling time of the compensated system is 4 sec
- The steady-state error to a unit ramp input must not exceed 10%

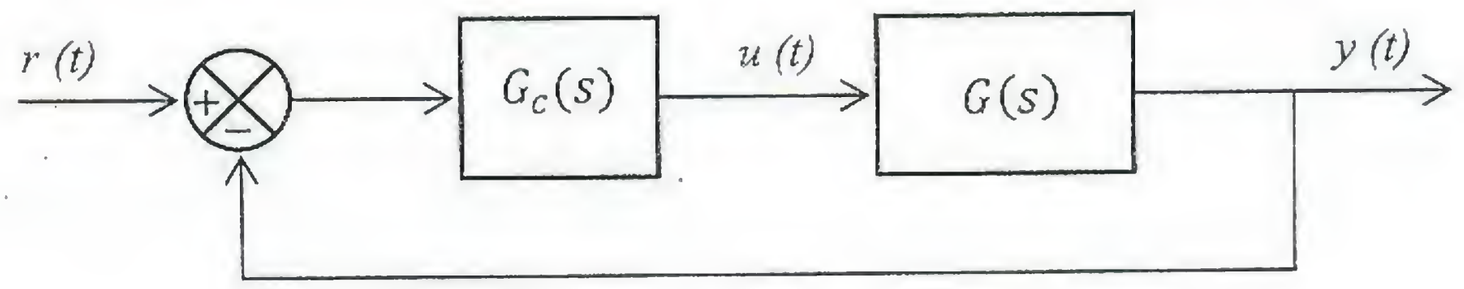


Fig. 2: Block diagram of problem 3

Problem (4) **(12 Marks)**

Design a phase-lead compensation network for the control system having the open loop transfer function:

$$G(s) = \frac{k}{s(s+4)(s+80)}$$

to meet the following design requirements:

- The desired phase margin of the compensated system, $PM \geq 45^o$
- The steady-state error to a unit ramp input must not exceed 4%

Good Luck

Dr. Ahmed A. Ramadan

Tanta University

Department: **Computers and Control Engineering**
Total Marks: 70 Marks

Faculty of Engineering

Course Title: **Fundamentals of Stochastic Processes** أسس العمليات العشوائية Course Code: CCE3117 3rd year
Date: 15.1.2013 (First term) Allowed time: 3 hrs No. of Pages: (2)

Answer the following four questions. You are allowed to use the accompanying two tables of standard normal curve ordinates and areas in your answers.

Question No. 1 *(16 marks)*

(a) Let **S={a, b, c, d, e, f}** with **P(a)=1/16**, **P(b)=1/16**, **P(c)=1/8**, **P(d)=3/16**, **P(e)=1/4** and **P(f)=5/16**. Let **A={a, c, e}**, **B={c, d, e, f}** and **C={b, c, f}**. Find:

i) P(A/B).
ii) P(B/C).
iii) $P(C/A^C)$.
iv) $P(A^C/C)$.

(b) Let A, B, and C be events. **Find an expression, and exhibit the Venn diagram**, for the event that:

i) A and B, but not C occurs.
ii) Only A occurs.

(c) In a certain college, 25% of the boys and 10% of the girls are studying mathematics. The girls constitute 60% of the students. If a student is selected at random and is studying mathematics, **determine the probability that the student is a girl?**

Question No. 2 *(18 marks)*

(a) Find the expectation, variance, and standard deviation of the random variable x with density function P(x) given as:

x	1	3	4	5
P(x)	0.4	0.1	0.2	0.3

(b) Prove that for any random variable x:

i) $E(ax + b) = a\,E(x) + b$
ii) $V(ax + b) = a^2\,V(x)$
iii) $E(c) = c$
iv) $V(c) = 0$

where a, b, and c are constants.

(c) If the density function f(x) is given by:

$$f(x) = \begin{cases} 1-x & 0 \le x \le 1 \\ x-1 & 1 \le x \le 2 \\ 0 & \text{elsewhere} \end{cases}$$

find the distribution function F(x).

Question No. 3

(18 marks)

(a) A coin, weighted with P(H)= 3/4 and P(T)= 1/4, is tossed three times. Let x be a random variable denoting the longest string of heads that occurs. **Find the distribution, expectation, variance, and standard deviation of x.**

(b) Consider the following binomial probability distribution:

$$P(x) = \binom{5}{x} (0.7)^x (0.3)^{5-x} \qquad (x = 0, 1, \ldots, 5)$$

where x is a random variable.

i) How many trials (n) are in the experiment?
ii) What is the value of p, the probability of success?
iii) Graph P(x).
iv) Find the mean and standard deviation of x.

(c) Suppose 2% of items made by a factory are defective. **Find the probability that there are 3 defective items in a sample of 100 items.**

Question No. 4

(18 marks)

(a) Let x be a random variable with a standard normal distribution Φ. **Find:**

i) $P(x \geq 1.13)$
ii) $P(0 \leq x \leq 1.24)$
iii) $P(0.65 \leq x \leq 1.26)$
iv) $P(-0.73 \leq x \leq 0)$

(b) Let x be a random variable with the standard normal distribution Φ. **Determine the value of t, standard units, if:**

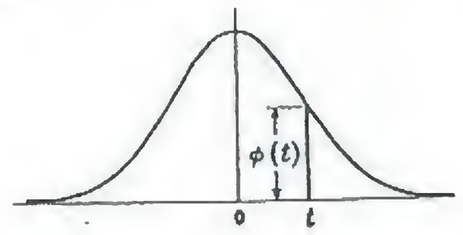
i) $P(0 \leq x \leq t) = 0.4236$
ii) $P(x \leq t) = 0.7967$
iii) $P(t \leq x \leq 2) = 0.1000$

(c) A class has 12 boys and 4 girls. If three students are selected at random one after the other from the class, **what is the probability that they are all boys?**

Best wishes

STANDARD NORMAL CURVE ORDINATES

This table gives values $\phi(t)$ of the standard normal distribution ϕ at $t \geq 0$ in steps of 0.01.

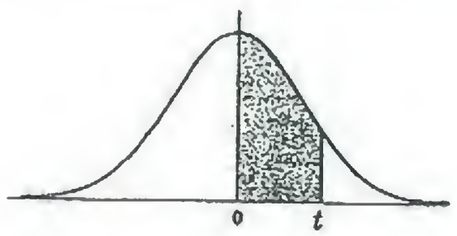


t	0	1	2	3	4	5	6	7	8	9
0.0	.3989	.3989	.3989	.3988	.3986	.3984	.3982	.3980	.3977	.3973
0.1	.3970	.3965	.3961	.3956	.3951	.3945	.3939	.3932	.3925	.3918
0.2	.3910	.3902	.3894	.3885	.3876	.3867	.3857	.3847	.3836	.3825
0.3	.3814	.3802	.3790	.3778	.3765	.3752	.3739	.3725	.3712	.3697
0.4	.3683	.3668	.3653	.3637	.3621	.3605	.3589	.3572	.3555	.3538
0.5	.3521	.3503	.3485	.3467	.3448	.3429	.3410	.3391	.3372	.3352
0.6	.3332	.3312	.3292	.3271	.3251	.3230	.3209	.3187	.3166	.3144
0.7	.3123	.3101	.3079	.3056	.3034	.3011	.2989	.2966	.2943	.2920
0.8	.2897	.2874	.2850	.2827	.2803	.2780	.2756	.2732	.2709	.2685
0.9	.2661	.2637	.2613	.2589	.2565	.2541	.2516	.2492	.2468	.2444
1.0	.2420	.2396	.2371	.2347	.2323	.2299	.2275	.2251	.2227	.2203
1.1	.2179	.2155	.2131	.2107	.2083	.2059	.2036	.2012	.1989	.1965
1.2	.1942	.1919	.1895	.1872	.1849	.1826	.1804	.1781	.1758	.1736
1.3	.1714	.1691	.1669	.1647	.1626	.1604	.1582	.1561	.1539	.1518
1.4	.1497	.1476	.1456	.1435	.1415	.1394	.1374	.1354	.1334	.1315
1.5	.1295	.1276	.1257	.1238	.1219	.1200	.1182	.1163	.1145	.1127
1.6	.1109	.1092	.1074	.1057	.1040	.1023	.1006	.0989	.0973	.0957
1.7	.0940	.0925	.0909	.0893	.0878	.0863	.0848	.0833	.0818	.0804
1.8	.0790	.0775	.0761	.0748	.0734	.0721	.0707	.0694	.0681	.0669
1.9	.0656	.0644	.0632	.0620	.0608	.0596	.0584	.0573	.0562	.0551
2.0	.0540	.0529	.0519	.0508	.0498	.0488	.0478	.0468	.0459	.0449
2.1	.0440	.0431	.0422	.0413	.0404	.0396	.0387	.0379	.0371	.0363
2.2	.0355	.0347	.0339	.0332	.0325	.0317	.0310	.0303	.0297	.0290
2.3	.0283	.0277	.0270	.0264	.0258	.0252	.0246	.0241	.0235	.0229
2.4	.0224	.0219	.0213	.0208	.0203	.0198	.0194	.0189	.0184	.0180
2.5	.0175	.0171	.0167	.0163	.0158	.0154	.0151	.0147	.0143	.0139
2.6	.0136	.0132	.0129	.0126	.0122	.0119	.0116	.0113	.0110	.0107
2.7	.0104	.0101	.0099	.0096	.0093	.0091	.0088	.0086	.0084	.0081
2.8	.0079	.0077	.0075	.0073	.0071	.0069	.0067	.0065	.0063	.0061
2.9	.0060	.0058	.0056	.0055	.0053	.0051	.0050	.0048	.0047	.0046
3.0	.0044	.0043	.0042	.0040	.0039	.0038	.0037	.0036	.0035	.0034
3.1	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026	.0025	.0025
3.2	.0024	.0023	.0022	.0022	.0021	.0020	.0020	.0019	.0018	.0018
3.3	.0017	.0017	.0016	.0016	.0015	.0015	.0014	.0014	.0013	.0013
3.4	.0012	.0012	.0012	.0011	.0011	.0010	.0010	.0010	.0009	.0009
3.5	.0009	.0008	.0008	.0008	.0008	.0007	.0007	.0007	.0007	.0006
3.6	.0006	.0006	.0006	.0005	.0005	.0005	.0005	.0005	.0005	.0004
3.7	.0004	.0004	.0004	.0004	.0004	.0004	.0003	.0003	.0003	.0003
3.8	.0003	.0003	.0003	.0003	.0003	.0002	.0002	.0002	.0002	.0002
3.9	.0002	.0002	.0002	.0002	.0002	.0002	.0002	.0002	.0001	.0001

Table 6.1

STANDARD NORMAL CURVE AREAS

This table gives areas under the standard normal distribution ϕ between 0 and $t \geq 0$ in steps of 0.01.



t	0	1	2	3	4	5	6	7	8	9
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0754
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2258	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2518	.2549
0.7	.2580	.2612	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2996	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990
3.1	.4990	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993
3.2	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995
3.3	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997
3.4	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998
3.5	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998
3.6	.4998	.4998	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.7	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.8	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.9	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000

Table 6.2

Tanta University

Department: Computer and Control Engineering
Total Marks: 70 Marks

Faculty of Engineering

Course Title: Digital Signal Processing	Course Code: CCE3116	3rd year
Date: January 2013 (First Term)	Allowed time: 3 hrs	No. of Pages: (2)

Remarks: (Answer the following questions... You may use the part of z-transform table given in page 2)

Problem number (1) **(14 Marks)**

(a) Consider the following discrete-time system **[6 Marks]**

$$y(n)=\sum_{k=-\infty}^{n} x(k),$$

Is this system
(i) Static or dynamic?
(ii) Causal or non-causal?
(iii) Stable or unstable?
Justify your answer.

(b) Consider the discrete-time sequence $x(n)$, **[8 Marks]**

$$x(n)=\left\{2,-1,2,\underset{\uparrow}{1},-2,1,-2\right\}$$

- **Sketch**
  (i) $x(n)$
  (ii) $F_1=x(n)u(n-2)$
  (iii) $F_2=x(-n)$
  (iv) $F_3=F_1+F_2$

Problem number (2) **(12 Marks)**

(a) Find the inverse z-transform of the following function as a weighted impulses **[6 Marks]**

(i) $X_1(z)=z^2\left(1-0.5z^{-1}\right)\left(1-z^{-1}\right)\left(1+z^{-1}\right)$

(ii) $X_2(z)=\dfrac{z}{z^2+1}$

(b) Find the z-transform and ROC for the following sequences **[6 Marks]**

(i) $x_1(n)=ne^{3n}u(n)$

(ii) $x_2(n)=(-1^n)u(n)$

Problem number (3) **(14 Marks)**

(a) Determine 4-point DFT of the following sequence **[5 marks]**

$$x(n)=\left\{\underset{\uparrow}{1},-1,0,1\right\}$$

(b) Compute the linear convolution, $y(n)=x(n)*h(n)$, where **[5 Marks]**

$$x(n)=u(n)-u(n-4)$$
$$h(n)=2\left[u(n)-u(n-4)\right]$$

(c) Determine the range of value 'a', for which the LTI system with impulse response **[4 Marks]**

$$h(n)=\begin{cases}a^n & ,n\geq 0\\ 0 & ,n<0\end{cases}$$

is stable.

Problem number (4) **(15 Marks)**

(a) Using radix-2 algorithm, obtain the 8-point FFT-DIF of the following sequence **[7 Marks]**

$$x(n) = \left\{ \underset{\uparrow}{0}, 1, 1, 1, 0, 1, 1 1 \right\}$$

Follow exactly the corresponding signal flow graph and keep track of all the intermediate quantities by putting them on the graph.

(b) A difference equation describing a filter is given below: **[8 Marks]**

$$H(z) = \frac{1 + z^{-2}}{(1 + z^{-1})(1 + 0.4z^{-1})(1 + 0.9z^{-1})}$$

Draw

(i) Direct form I
(ii) Direct form II
(iii) Parallel form
(iv) Cascade form

Problem number (5) **(15 Marks)**

(a) Given the following low pass filter, **[6 Marks]**

$$H(s) = \frac{1}{s + 1}$$

use bilinear transformation to design a corresponding digital low pass filter with cutoff frequency of 50 Hz and sampling rate of 1 khz.

(b) Design a second order digital high pass Butterworth filter with the following specifications:

- Cut-off frequency of 1.6 khz **[9 Marks]**
- A sampling frequency of 4 kHz.

GOOD LUCK

Dr. Ali Abu Tahoun

$x(n)$	$X(z)$
$\delta(n)$	1
$u(n)$	$\frac{z}{z-1}$
$a^n u(n)$	$\frac{z}{z-a}$
sin (an)	$\frac{z \sin(a)}{z^2 - 2z\cos(a) + 1}$
cos (an)	$\frac{z[z - \cos(a)]}{z^2 - 2z\cos(a) + 1}$

Tanta University
Faculty of Engineering,
Computer & Control Engineering Dept.,
Date: 20 /1/ 2013

Final Term Exam
Compiler Design
3rd year
Allowed Time: Three Hours

Answer The Following Questions:

The First Question (20 Mark)

(a) Indicate whether each of the following statements is ***true*** or ***false***, and if it is ***false*** correct it.
   a. Scanners perform syntax analysis.
   b. An interpreter is a form of compiler that runs slowly.
   c. A parser recognizes phrases structure in an input stream.
   d. All regular grammars are right linear.
   e. All right linear grammars are context-free.

(b) Why a compiler phases may be separated into front-end and back-end parts?

(c) Corresponding to the following input statement:
   x := d * (a - b) * c + (a – b) * c;
   a. Show the output of the scanner, parser, and code generator of a **compiler**.
   b. Show the output of an **interpreter**.

The Second Question (20 Mark)

(a) What is the main functionality of a symbol table? Provide two implementation techniques of such table and an advantage of each provided technique.

(b) Show a finite state machine in either state graph or table form for the following language: "Strings containing an even number of **zeros** and an odd number of **one's**". What is the input alphabet of this language?

(c) Show the balanced and not balanced binary search trees which would be constructed to store each of the following lists of identifiers: Hill, cat, bat, bird, tree, frog, dog, cow

The Third Question (20 Mark)

(a) What is each of the following terms means in compiler design: ***a simple language***, ***a derivation***, ***a terminal***, ***a non-terminal***, and ***a handle***?

(b) Suppose L1 represents the set of all strings from the alphabet {0,1} which contain an even number of one's (even parity). Which of the following strings belong to L1?
   (1) 0101 (2) 110211 (3) 010011

(c) Given the following grammar:
   1. A → A * A **2. A → A / A**
   3. A → (A) **4. A → c**
   1. Classify the above grammar according to Chomsky's definitions.
   2. Is the above grammar ambiguous one? If the answer is yes eliminate its ambiguity.

The Fourth Question (20 Mark)

(a) What is each of the following terms in compiler design means: Translator, Preprocessor, Compiler, Self-resident translator, and Cross-translator?

(b) Determine if the following grammars is simple or not.

```
1.  Expr  →  Expr + Term
2.  Expr  →  Term
3.  Term  →  var
4.  Term  →  ( Expr )
```

(c) Given the following grammar:

```
1.  S  →  a A b S
2.  S  →  ε
3.  A  →  a S b
4.  A  →  ε
```

1. Find the follow set for each non-terminal.
2. Show a pushdown machine for the language of this grammar.
3. Show a recursive descent parser for this grammar.

With my best wishes

Tanta University
Faculty of Engineering
Computer & Control Dep.
3rd Year

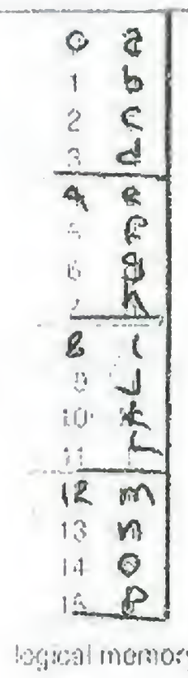
Final Te.
Operating .
Time: 3Hour.
24 January, 20.

[1.1].What are the techniques that Operating system use in allocating processes in memory? What its effect about fragmentation problem? How to overcome the fragmentation problem? ..... .[5 M]

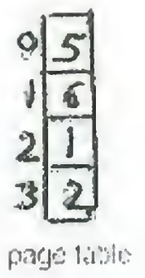
[1.2]. Draw the contents of the physical memory according to Fig.1. [3 M]

[1.3].Consider a paged logical address space (composed of 32 pages of 2 Kbytes each) mapped into a 1-MByte physical memory space. [6 M]

a. What is the format of the processor's logical address?
b. What is the length and width of the page table (disregarding the "access rights" bits)?
c. What is the effect on the page table if the physical memory space is reduced by half?



logical memory



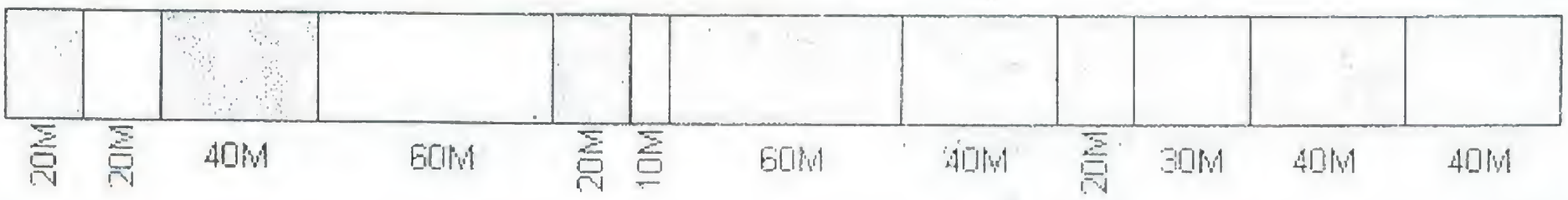
page table

[2.1]. What is the physical memory address of the following logical address using the segment tale shown.
a.1, 100 b. 2, 500 **[4 Marks]**

segment	Base	Limit
0	1000	301
1	2500	105
2	3400	475
3	2150	222

Segment table

[2.2] The dynamic partitioning scheme is being used, and the following is the memory configuration at a given point of time, the shaded areas are allocated blocks; the white areas are free blocks:



The next four memory allocation requests are: A= 35M, B= 19M, C= 10M, D= 55M (in order). Where would each of the ***First-fit***, ***Best-fit*** and ***Worst-fit*** algorithms place the four processes? What is the internal and external fragmentation in each algorithm? **[6 Marks]**

3.1. Explain with graph, how the operating system deal with page fault. **[4 Marks]**

3.2 Consider the processor has these logical addressees: 315, 210, 034, 730, 550, 277, 396, 534, 117, and 444. Assuming the page size is 64 byte. What is the page-reference string? **[3 Marks]**

3.3. Consider the following page-reference string:
1, 2, 3, 4, 5, 3, 4, 1, 6, 7, 8, 7, 8, 9, 7, 8, 9, 5, 4, 5, 4, 2. How many page faults would occur for different replacement algorithms, using **four** frames? Remember that all frames are initially empty, so your first unique pages will all cost one fault each.
Draw the state of the stack during the LRU algorithm **[8 Marks]**

4.1. Consider the following set of processes, with the length of the CPU-burst time given in milliseconds **[10 Marks]**

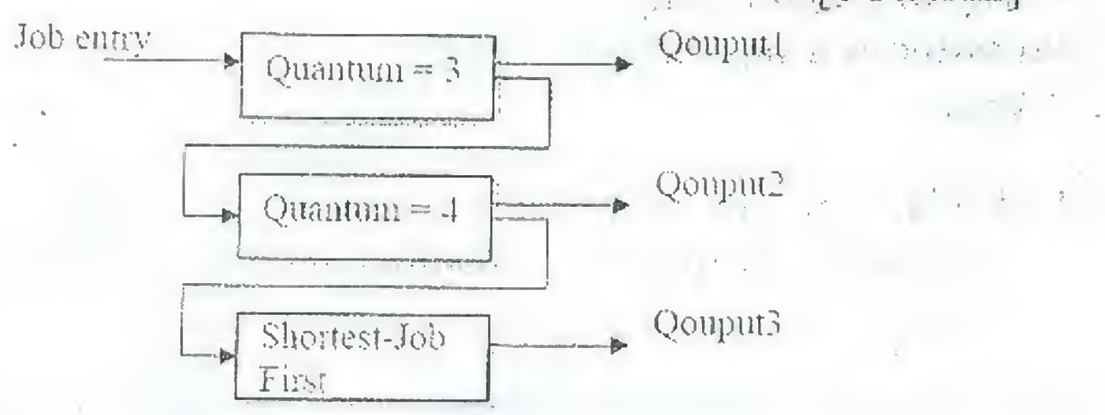
Process	Arrival time	Burst time	Priority
P1	0	53	3
P2	60	17	2
P3	40	68	1
P4	20	24	3
P5	80	38	2

a. Draw four Gantt charts illustrating the execution of these processes using FCFS, SRTF, a non-preemptive priority (a smaller priority number implies a higher priority), and RR (quantum = 20) scheduling

b. What is the average waiting time, turnaround time, and number of context switch times of each scheduling algorithms in part a?

4.2. Show your schedule with timeline and Calculate the **average "turnaround" time** when use the **multi-level feedback queue** as below **[6 Marks]**

Process ID	Arrival Time	Burst Time
A	0	7
B	2	9
C	5	4
D	7	8
E	8	2



5.1Write True or False and correct the false **[25 marks-1 Mark each]**

1. If you have more frames, you always has low less page faults
2. Page size is always of power 2
3. Page table is always stored in primary memory
4. Virtual memory is usually smaller than physical memory
5. LIFO page replacement strategy is an example of a stack algorithm
6. LRU algorithm suffer from Beladey's anomaly
7. Page faults decreases effective access time
8. Distributed system share the memory and bus
9. Hard real time systems have no flexibility of time
10. Process Consist of One or more threads
11. System call is the interface between a running program and the operating system
12. Interrupt Service Routine contains the addresses of all the service routines
13. A gaining is the solution of starvation problem.
14. FCFS suffer from Starvation problem
15. SRTF scheduling algorithm has minimum response time
16. Boot strap program is stored in the Kernel
17. A virtual machine provides an interface identical to the underlying bare hardware
18. Communication between process using either message passing or shared memory
19. When an interrupt occurs, control passes from the "interrupt vectors" to a service routine in the operating system.
20. System calls invoke interrupt handling routines.
21. The C language does not allow system calls directly to the hardware. It is necessary to go through the operating system first.
22. Open and close are process management system calls.
23. Useful instructions executed during context switch time are invoked by and exec instruction.
24. An operating system has better modularity if it is implemented using a layered design.
25. The list of open files is stored in the process control block.